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ABSTRACT

Among students and faculty as well, there are widespread beliefs that some departmental programs impose stringent demands on students while others are relatively undemanding. A second notion is that students with a given level of academic talent gravitate to departments whose demands correspond with the student's talent. It was therefore the purpose of this study: (1) to look at the typical levels of academic talent of persons who succeed in various departments; (2) to observe variations in talent within programs and see to what extent overlap in talent exists among departments; and (3) to see to what extent talent corresponds with mean gradepoint averages across programs. The Scholastic Aptitude Test (SAT-M and SAT-V) and the student's high school rank (HSR) were used as predictors of academic talent. The results of the study clearly indicate that some departments attract students with more talent than do others. However, it is also indicated that the range of talent among students within a given department is also conspicuous. (Author/HS)

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INDIANA STUDIES IN PREDICTION NO. 17

ACADEMIC TALENT AND GRADE ACHIEVEMENT OF GRADUATES

by

Clinton I. Chase

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ACADEMIC TALENT AND GRADE ACHIEVEMENT OF GRADUATES
A Departmental Study of the College Boards

The Problem

Among students, and faculty as well, there are widespread beliefs that some departmental programs impose stringent demands on students, and others are fairly undemanding. A second notion is that students with a given level of academic talent gravitate to departments whose demands correspond with the student's talent. It was therefore the purpose of this study first to look at the typical levels of academic talent of persons who succeed in various departments; secondly, to observe variation in talent within programs and see to what extent overlap in talent exists between departments; and last, to see to what extent talent corresponds with mean grade-point averages across programs.

Studies have shown that for entering freshmen the College Board's Scholastic Aptitude Tes (SAT) and the student's rank in his high school class (HSR) are positively related to success in at least the initial year's work at Indiana University (Chase, et al. 1963). These variables were then selected for the present study as indicators of academic talent. Degree programs which in 1971 graduated fifteen or more students with complete SAT and HSR data were identified. Thirty-one of these programs were located by a count of names listed in the graduation proceedings for commencement in June 1971.

The final step was to collect the talent data and GPA's. Students typically take the SAT as a prerequisite to freshman admissions. Also, admissions records list the position of a student in his high school class as well as the number of students in this class. These data were then grouped by degree program. Basic descriptive statistics were computed for each program group of graduates.

Results

The results are presented first in tabular form and then graphically. Talent data will be reported first. The mean SAT Verbal score and mean SAT Mathematics score were computed for students in each of the thirty-one programs in the study. These data are presented in Table 1. The Mathematical talents of departments appear to be slightly stronger than the Verbal talents. However, the mean performance for the bulk of the departments appears to be not far from a hypothetical national average of 500. Most department means range between 460 and 560 on the Verbal scale and 480 and 580 on the Mathematical scale.

Table 1. Frequency distributions of mean SAT Verbal and Mathematics scores for students in departments graduating 15 or more people in 1971.

Score Interval	No. of Depts. with Mean SAT-V	No. of Depts. with Mean SAT-M
640-659		1
620-639		1
600-619		0
580-599	1	2
560-579	2	5
540-559	7	7
520-539	5	2
500-519	5	7
480-499	3	4
460-479	7	2
440-459	0	
420-439	1	

The most striking feature in Table 1 is the wide difference in average talent among the programs. The program with lowest mean SAT-V (426) was 160 points below the mean of the program group with the highest SAT-V (590). Almost 180 points difference existed between the lowest and highest average SAT-M scores (471 and 648). These data would appear to suggest that students who enter Indiana University with a given level of scholastic aptitude gravitate to selected departments. However, an observation of the overlap in aptitude among departments will somewhat temper this conclusion.

Table 2. A frequency distribution of mean high school ranks for students by departments which graduated 15 or more people in 1971. (Rank = position in class/no. in class)

Rank	No. of Depts. with Mean Rank
.10-.09	1
.12-.11	4
.14-.13	2
.16-.15	1
.18-.17	6
.20-.19	3
.21-.22	4
.23-.24	3
.26-.25	2
.28-.27	1
.30-.29	2
.32-.31	1
.34-.33	1

Table 2 shows a distribution of mean high school ranks for students who graduated among the 31 degree programs. The ratio of a student's position in his high school class, and the number of students in the class was used, because being at a given rank among one's peers is "good" only in terms of the possible positions. For example, 10th out of 20 students does not reflect the same talent as 10th among 500 students. Therefore, rank was divided by the number in the high school class to provide a fraction somewhat more comparable from class to class than is rank alone.

As the data in Table 2 indicate the typical high school performance varies widely from program to program. Although most of the programs had students with a mean high school rank above the upper 25 per cent of their class, seven of the 31 programs had students whose mean ranks were at, or below, the upper 25 per cent point.

It is interesting to note that among these seven programs lowest in high school rank, five are also in the lowest seven in mean SAT-V, but only one is in the lowest seven in SAT-M. On the other end of the scale, of the top seven departments in mean high school rank, four are also among the top seven in mean SAT-V, while three are in the top seven in SAT-M. These observations would appear to suggest that the SAT-V may be more closely associated with high school rank than is SAT-M.

To this point only mean performances for various program areas have been observed. However, the range of talent within a program and the overlap between programs are also of interest. The basic data here are provided in Figures 1, 2, and 3.

Figure 1 shows the total range of high school ranks (HSR) within each program, arranged in order of mean ranks. For some programs the ranges are fantastic, while other programs show much more homogeneity among their majors. For example,

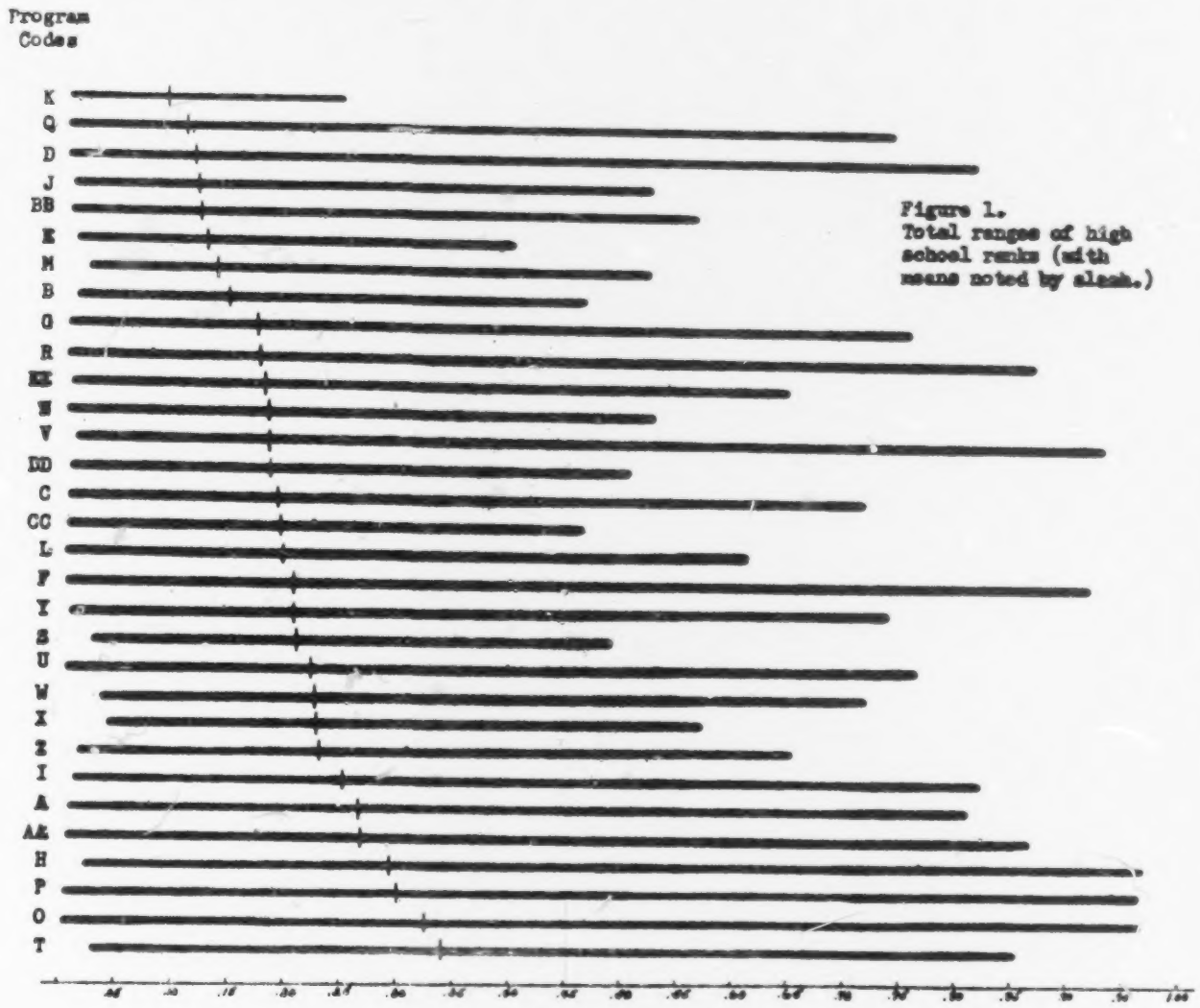

Figure 1.
Total ranges of high school ranks (with means noted by slash.)

program D, with the third highest mean high school rank, contained students who ranked in the lowest 20 per cent of their high school class. On the other hand in program E, with the sixth highest mean HSR, almost all of the students were in the upper third of their classes.

Some further comparisons in HSR are of interest. The lowest ranking student in the program that had the lowest mean (Program T) was higher than the lowest ranking student in at least seven other programs. Although high school rank has often been shown to be as good a predictor of college grades as any other single indicator, clearly some students who have done poorly in high school can compete effectively with students whose high school records look much better. It should be noted, however, that the distributions of high school rank are sharply skewed toward the higher ranks, and that the widely deviating student that sets the lower limits of the range for his program is clearly an exception among his peers.

The distribution of SAT scores for each program was reported in a slightly different fashion from high school ranks. Since these data were much more bell-shaped in their distribution, the standard deviation could be applied as an indicator of dispersion. If one standard deviation is added to the mean and one subtracted from the mean, the area between these two points in a normally distributed group cuts off the middle two thirds of the cases. With the total range, a single person (e.g., the lowest scoring case) determines the limit. The total range may be an unstable indicator of spread of

scores. But all scores are involved in computing the standard deviation. For this reason it is a more stable indicator of dispersion than is the range. Therefore, where data are not markedly skewed the standard deviation is preferred to the range as an indicator of spread of scores.

For the SAT-V the data are given in Figure 2. The data show that for the most part the middle two thirds of the group fall within plus-and-minus of about 80 points of the program mean. There is one notable exception to this. Program E produced a standard deviation of only 53 points. It would be interesting to find out what makes persons in this program so much more homogeneous in Verbal ability than is true of students in other programs.

The conspicuous overlap in SAT-V among programs is also noted in Figure 2. Program T has the lowest mean Verbal score. The person at one standard deviation above the mean in this program has peers with equal scores in each of the entire 30 remaining programs. However, that same person who ranks high in program T would rank below the mean SAT-V for 18 of those other programs. It is also interesting to note on the other end of the scale that in the program with highest mean SAT-V (Program B) the student who ranks one standard deviation below the program mean ranks above the mean of thirteen other programs. Clearly the differences in verbal talent among programs is conspicuous.

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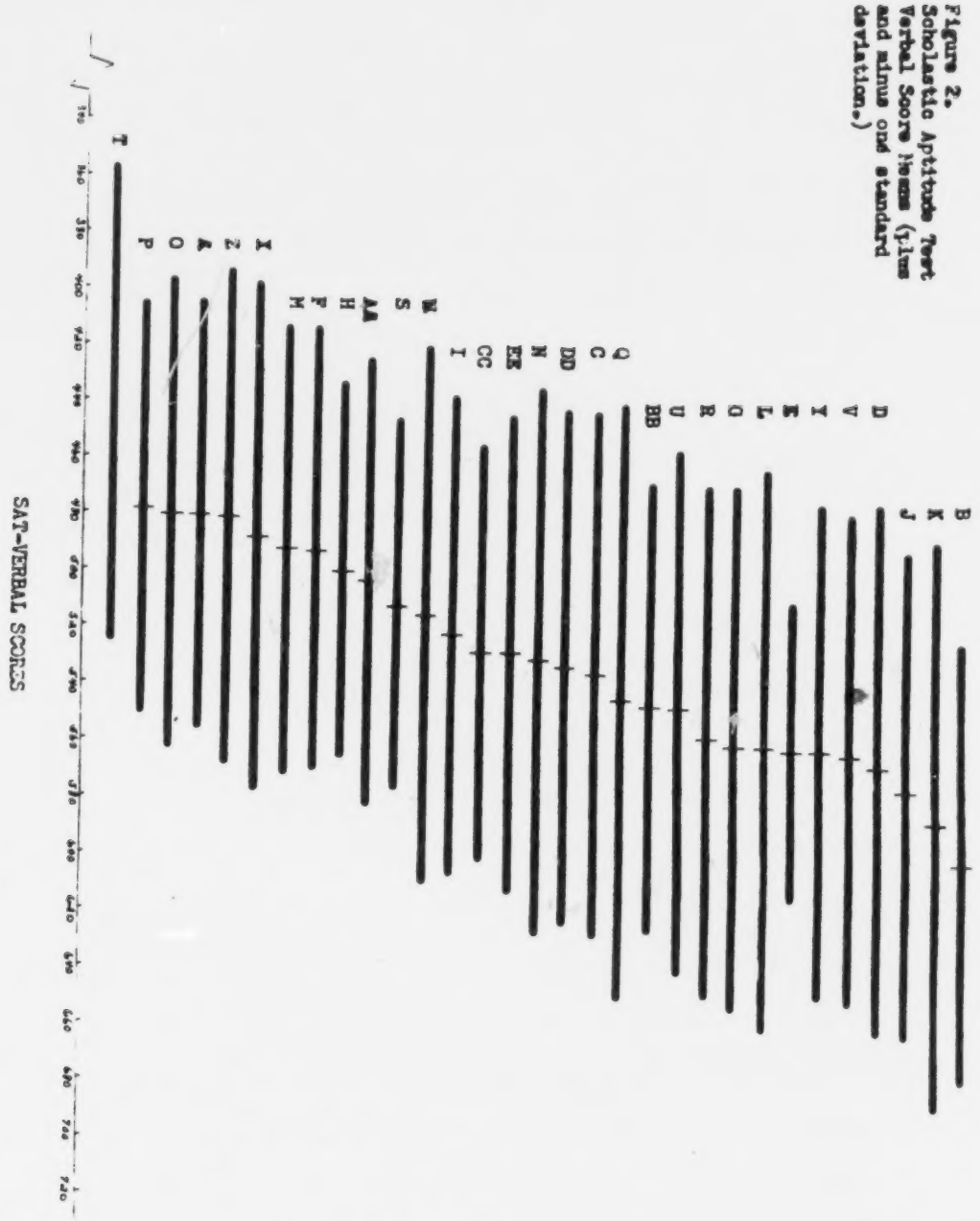

Figure 2.
Scholastic Aptitude Test Verbal Score Norms (plus and minus one standard deviation.)

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Figure 3 shows the programs ranked by mean SAT-M scores with the range of plus-and-minus one standard deviation marked off. The range of numerical talent within programs is slightly larger for SAT-M than for SAT-V. Almost all programs have standard deviations of roughly 90 to 100 points. Most persons who deal with the College Board scores would probably agree that this is a rather large dispersion of ability within a selected group such as found in a program area. One program is conspicuous because it shows notably greater heterogeneity than the others. Program CC has a standard deviation of 116 points. Clearly the range in mathematical talent among students within this program is remarkable.

The overlap among programs in numerical ability is about like the overlap in verbal skill. The person who ranks one standard deviation above the mean in the lowest ranking program (Program X) has peers with equal talent in all programs. This person ranks below the mean of only seven programs. However, the person who stands one standard deviation below the mean of the highest ranking program (Program Q) is above the mean of twenty-four other programs. The differences in talent between the highest ranking departments and all others is most noticeable. It is also interesting to note how much alike the departments are that rank from 7th through 13th from the bottom (Z, I, AA, M, BB, O, CC).

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Figure 3.
Scholastic Aptitude Test
Mathematical Score Means
(plus and minus 1
standard deviation)

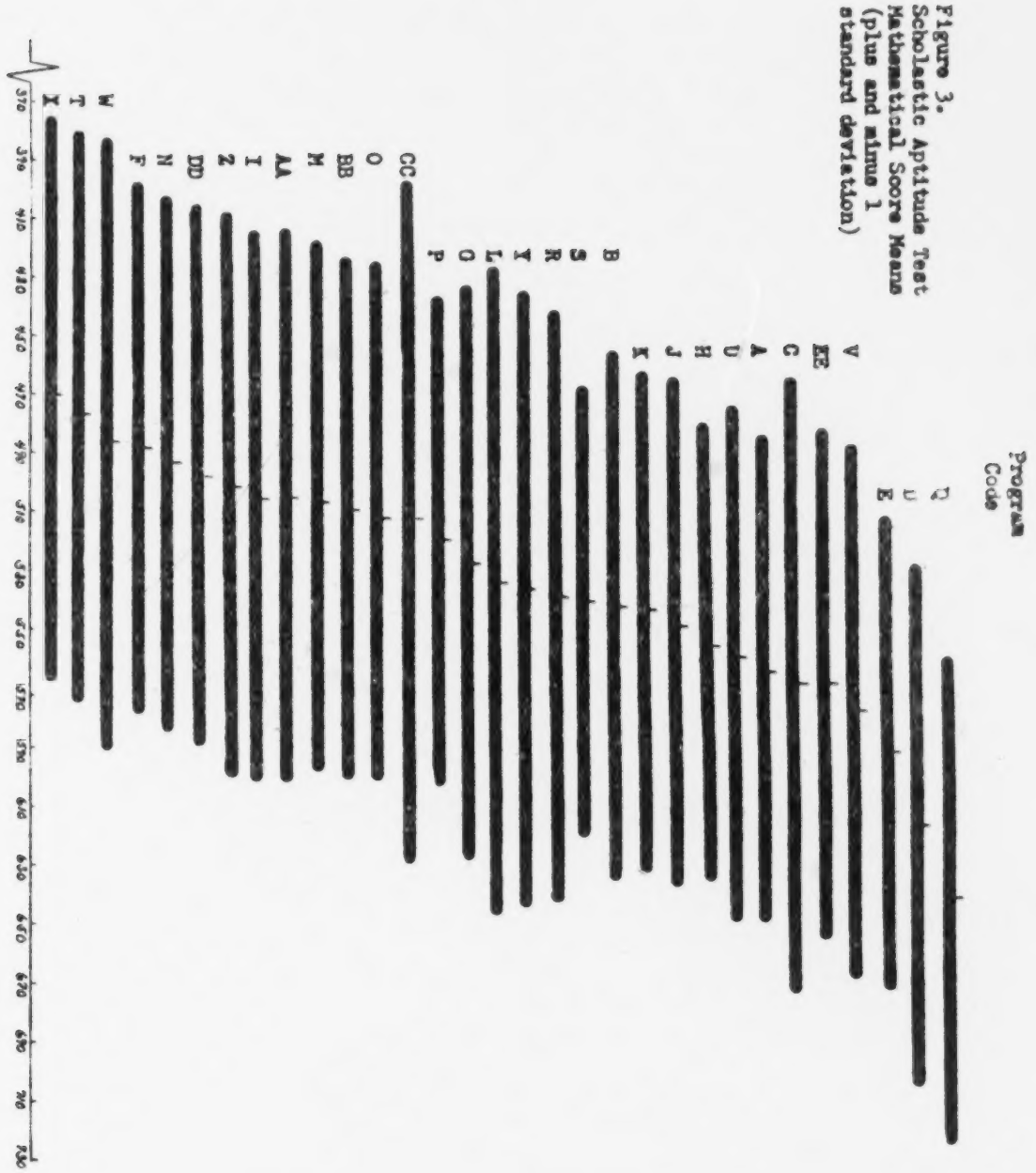

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Table 3. Ranks of GPA and talent indicators.

Program	GPA Rank	Ave. Talent Rank	Talent Rankings SAT-V RANK	SAT-M RANK	HSR Rank
A	24	20	28	7	26
B*	12.5	7	1	12	8
C	16	12	14	6	15
D	8	3	4	2	3
E*	20	6	7	3	6
F**	12.5	23	24	28	18
G	5	12	9	17	9
H*	31	20	23	9	28
I	14.5	23	19	24	25
J	6.5	6	3	10	4
K	2	4	2	11	1
L	14.5	14	8	16	17
M	18.5	18	25	22	7
N	23	18	16	27	12
O	30	26	29	20	30
P	28.5	26	30	18	29
Q	9.5	5	13	1	2
R**	1	11	10	14	10
S	26.5	18	21	13	20
T**	21	31	31	30	31
U	18.5	13	11	8	21
V	9.5	7	5	4	13
W	28.5	24	20	29	22
X**	11	27	26	31	23
Y*	26.5	13	6	15	19
Z	25	26	27	25	24
AA	17	24	22	23	27
BB	6.5	13	12	21	5
CC**	3.5	18	18	19	16
DD**	3.5	18	15	26	14
EE	22	11	17	5	11

* hard graders.
** easy graders.

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Mean GPA's for programs were ranked from high to low (1 being highest) and these ranks were compared with the ranks of talent indicators. This comparison is made in Table 3. Only a low to moderate correspondence was found between talent indicators and mean GPA's.

The relationship between the mean GPA's for program indicators is further born out in Table 4. Here we have the product moment correlations of mean talent indicators with mean GPA. The results again show a low to moderate relationship between mean GPA's for departments and mean talent indicators.

Table 4. Correlation of mean talent indicators with mean GPA.

talent indicator	r with GPA
SAT-V	0.58
SAT-M	0.14
HSR	- 0.59

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Programs whose mean GPA rank was ten points higher (shown by smaller numbers) than the average talent rank were operationally defined as "easy graders," while programs whose mean GPA was ten points lower (larger numbers) than the average talent rank were called "hard graders." There were four hard grading programs (B, E, H, Y) and six who were easy graders (F, R, T, X, CC, DD). Hard grading departments were not in the sciences, as sometimes supposed; easy grading departments all were in applied areas.

We have just seen that there is a) a considerable variation among departments in the academic talent indicators, and b) there is within each program a considerable variation among the departmental majors in these talent indicators. What does this mean in terms of mean grade-point averages (GPA)?

The lowest mean GPA (2.76) was for Program H; the highest mean GPA (3.45) was for Program R. The average for the median GPA's was 3.09. As seen in Table 5, almost two thirds of the mean GPA's fell between 2.95 and 3.34, a range of only 0.39 of a grade point. The data appear to indicate a conspicuous homogeneity of mean GPA's among the 31 programs, in spite of the wide differences in talent among departments.

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Table 5. A tabulation of the mean GPA's of students in the 31 programs.

Mean GPA	Number of programs
3.45-3.55	1
3.35-3.44	0
3.25-3.34	6
3.15-3.24	4
3.05-3.14	8
2.95-3.04	2
2.85-2.94	3
2.75-2.84	2

Conclusions.

The differences in academic talent among graduates from various departments is very striking. A difference of 160 points existed between the department with the lowest and the highest, mean SAT-V. The comparable difference for the SAT-M was 180 points. These differences appear even larger when we note that in each of these tests we usually expect about two thirds of college students to range ± 100 points from the test mean. Clearly some departments attract students with more talent than do others.

However, the range of talent among students within a given department is also conspicuous. The spread of scores within a department approaches the spread expected for students in general, i.e., near ± 100 from the departmental average.

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The range of mean GPA's among departments is not great. Roughly a range of a third of a grade point in the center of the distribution includes two thirds of the departments. The conspicuous spread among departments in talent indicators is not evident in mean GPA's.

Mean GPA's tend to rank departments in the order of their mean talent indicators, but this tendency is reflected in only a low to moderate correlation between GPA and talent indicators.